

$$x + y - 2z = 14$$

$$2x - y + z = 0$$

$$6x + 3y + 4z = 4$$

$$\begin{vmatrix} 1 & 1 & -2 & 14 \\ 2 & -1 & 1 & 0 \\ 6 & 3 & 4 & 4 \end{vmatrix} = (1)(1)(4) + (1)(1)(6) + (-2)(2)(3) - [(6)(-1)(-2) + (3)(1)(14) + (4)(2)(1)]$$

$$= -33$$

$$\Delta S = -33$$

Encontrando para x''

$$\begin{vmatrix} 14 & 1 & -2 & 4 \\ 0 & -1 & 1 & 0 \\ 1 & 3 & 4 & 1 \end{vmatrix} = (14)(-1)(1) + (1)(1)(1) + (-2)(1)(3) - [(1)(-1)(-4) + (3)(1)(4) + (14)(1)(1)]$$

$$= -56 + 1 - 2 - 42 = -99$$

Encontrando para y''

$$\begin{vmatrix} 1 & 14 & -2 & 14 \\ 2 & 0 & 1 & 0 \\ 6 & 1 & 4 & 1 \end{vmatrix} = (1)(14)(1) + (14)(1)(6) + (-4)(2)(1) - [(6)(1)(-2) + (1)(1)(1) + (4)(2)(14)]$$

$$= 80 - 113$$

$$= -33$$

Encontrando para z''

$$\begin{vmatrix} 1 & 1 & 14 & 1 \\ 2 & -1 & 0 & 2 \\ 6 & 3 & 1 & 6 \end{vmatrix} = (1)(-1)(1) + (1)(1)(6) + (14)(2)(3) - [(6)(-1)(4) + (3)(1)(1) + (1)(2)(1)]$$

$$= 83 - 82 = 1$$

Encontrando x'' , y'' y z''

$$x = \frac{\Delta x}{\Delta S} = \frac{-99}{-33} = 3$$

$$y = \frac{\Delta y}{\Delta S} = \frac{-33}{-33} = 1$$

$$z = \frac{\Delta z}{\Delta S} = \frac{1}{-33} = -5$$

$$\begin{aligned} 2. \quad & 2x + y + z = 4 \\ & 10x - 2y + 2z = -1 \\ & 6x - 2y + 4z = 8 \end{aligned}$$

$$\begin{vmatrix} 2 & 1 & 1 \\ 10 & -2 & 2 \\ 6 & -2 & 4 \end{vmatrix}$$

$$\begin{vmatrix} 2 & 1 & 1 \\ 10 & -2 & 2 \\ 6 & -2 & 4 \end{vmatrix} = 2 \begin{vmatrix} -2 & 2 \\ -2 & 4 \end{vmatrix} = 2 [(-2)(4) - (-2)(2)]$$

$$= 2 [-8 + 4]$$

$$= \underline{-8}$$

$$\begin{vmatrix} 2 & 1 & 1 \\ 10 & -2 & 2 \\ 6 & -2 & 4 \end{vmatrix} = -1 \begin{vmatrix} 10 & 2 \\ 6 & 4 \end{vmatrix} = -[(10)(4) - (6)(2)]$$

$$= -[40 - 12]$$

$$= \underline{-28}$$

$$\begin{vmatrix} 2 & 1 & 1 \\ 10 & -2 & 2 \\ 6 & -2 & 4 \end{vmatrix} = 1 \begin{vmatrix} 10 & -2 \\ 6 & -2 \end{vmatrix} = (10)(-2) - (6)(-2)$$

$$= -20 + 12$$

$$= \underline{-8}$$

$$\Delta y = -8 - 28 - 8 = -44$$

Sustituyendo para encontrar "x"

$$\begin{vmatrix} 4 & 1 & 1 \\ -1 & -2 & 2 \\ 8 & -2 & 4 \end{vmatrix} = 4 \begin{vmatrix} -2 & 2 \\ -2 & 4 \end{vmatrix} = 4 [(-2)(4) - (-2)(2)]$$

$$= 4 [-8 + 4]$$

$$= \underline{-16}$$

$$\begin{vmatrix} 4 & 1 & 1 \\ -1 & -2 & 2 \\ 8 & -2 & 4 \end{vmatrix} = -1 \begin{vmatrix} -1 & 2 \\ 8 & 4 \end{vmatrix} = -1 [(-1)(4) - (8)(2)]$$

$$= -1 [-4 - 16]$$

$$= \underline{20}$$

$$\begin{vmatrix} 4 & 1 & 1 \\ -1 & -2 & 2 \\ 8 & -2 & 4 \end{vmatrix} = 1 \begin{vmatrix} -1 & -2 \\ 8 & -2 \end{vmatrix} = (-1)(-2) - (8)(-2)$$

$$= 2 + 16$$

$$= \underline{18}$$

$$\Delta x = -16 + 20 + 18 = 22$$

Sustituyendo para "y"

$$\begin{vmatrix} 2 & 4 & 1 \\ 10 & -1 & 2 \\ 6 & 8 & 4 \end{vmatrix} = 2 \begin{vmatrix} -1 & 2 \\ 8 & 4 \end{vmatrix} = 2 [(-1)(4) - (8)(2)]$$

$$= 2 [-4 - 16]$$

$$= 2 [-20]$$

$$= -40$$

$$\begin{vmatrix} 2 & 4 & 1 \\ 10 & -1 & 2 \\ 6 & 8 & 4 \end{vmatrix} = -4 \begin{vmatrix} 10 & 2 \\ 6 & 4 \end{vmatrix} = -4 [(10)(4) - (6)(2)]$$

$$= -4 [40 - 12]$$

$$= -4 [28]$$

$$= -112$$

$$\begin{vmatrix} 2 & 4 & 1 \\ 10 & -1 & 2 \\ 6 & 8 & 4 \end{vmatrix} = 1 \begin{vmatrix} 10 & -1 \\ 6 & 8 \end{vmatrix} = (10)(8) - (6)(-1)$$

$$= 80 + 6$$

$$= 86$$

$$\Delta y = -40 - 32 + 86$$

$$\Delta y = 14$$

$$\Delta y = -40 - 112 + 86$$

$$\Delta y = -66$$

Sustituyendo para "z"

$$\begin{vmatrix} 2 & 1 & 4 \\ 10 & -2 & -1 \\ 6 & -2 & 8 \end{vmatrix} = 2 \begin{vmatrix} -2 & -1 \\ -2 & 8 \end{vmatrix} = 2 [(-2)(8) - (-2)(-1)] = 2 [-16 - 2] = 2 [-18]$$

$$= -36$$

$$\begin{vmatrix} 2 & 1 & 4 \\ 10 & -2 & -1 \\ 6 & -2 & 8 \end{vmatrix} = -1 \begin{vmatrix} 10 & -1 \\ 6 & 8 \end{vmatrix} = -[(10)(8) - (6)(-1)] = -[80 + 6] = -86$$

$$\begin{vmatrix} 2 & 1 & 4 \\ 10 & -2 & -1 \\ 6 & -2 & 8 \end{vmatrix} = 4 \begin{vmatrix} 10 & -2 \\ 6 & -2 \end{vmatrix} = 4 [(10)(-2) - (6)(-2)] = 4 [-20 + 12] = 4 [-8]$$

$$= -32$$

$$\Delta z = -36 - 86 - 32 = -154$$

$x = \frac{\Delta x}{\Delta S}$	$y = \frac{\Delta y}{\Delta S}$	$z = \frac{\Delta z}{\Delta S}$
$x = \frac{22}{-44}$	$y = \frac{-66}{-44}$	$z = \frac{-154}{-44}$
$x = -\frac{1}{2}$	$y = \frac{3}{2}$	$z = \frac{7}{2}$

$$\begin{aligned} 3, \quad -2x + 2y + 3z &= 1 \\ x - y &= 3 \\ y + 4z &= -2 \end{aligned}$$

$$\begin{vmatrix} -2 & 2 & 3 \\ 1 & -1 & 0 \\ 0 & 1 & 4 \end{vmatrix} = -1 \begin{vmatrix} 2 & 3 \\ 1 & 4 \end{vmatrix} = -[2(4) - 1(3)] = -5$$

$$\begin{vmatrix} -2 & 2 & 3 \\ 1 & -1 & 0 \\ 0 & 1 & 4 \end{vmatrix} = -1 \begin{vmatrix} -2 & 3 \\ 0 & 4 \end{vmatrix} = -[(-2)(4) - (0)(3)] = +8$$

$$\begin{vmatrix} -2 & 2 & 3 \\ 1 & -1 & 0 \\ 0 & 1 & 4 \end{vmatrix} = 0 \begin{vmatrix} -2 & 3 \\ 0 & 1 \end{vmatrix} = 0$$

$$\Delta x = -5 + 8 + 0$$

$$\Delta x = 3$$

Encontrando " Δx "

$$\begin{vmatrix} 1 & 2 & 3 \\ -2 & -1 & 0 \\ -1 & 1 & 4 \end{vmatrix} = -3 \begin{vmatrix} 2 & 3 \\ 1 & 4 \end{vmatrix} = -3[2(4) - 1(3)] = -3[8 - 3] = -3[5] = -15$$

$$\begin{vmatrix} 1 & 2 & 3 \\ -2 & -1 & 0 \\ -1 & 1 & 4 \end{vmatrix} = -1 \begin{vmatrix} 1 & 3 \\ -2 & 4 \end{vmatrix} = -1[1(4) - (-2)(3)] = -1[4 + 6] = -10$$

$$\Delta x = -15 - 10 + 0 = -25$$

Encontrando " Δy "

$$\begin{vmatrix} -2 & 1 & 3 \\ 1 & -1 & 0 \\ 0 & -2 & 4 \end{vmatrix} = -1 \begin{vmatrix} 1 & 3 \\ -2 & 4 \end{vmatrix} = -1[1(4) - (-2)(3)] = -1[4 + 6] = -10$$

$$\begin{vmatrix} -2 & 1 & 3 \\ 1 & -1 & 0 \\ 0 & -2 & 4 \end{vmatrix} = 3 \begin{vmatrix} -2 & 3 \\ 0 & 4 \end{vmatrix} = 3[(-2)(4) - (0)(3)] = 3(-8) = -24$$

$$\begin{vmatrix} -2 & 1 & 3 \\ 1 & -1 & 0 \\ 0 & -2 & 4 \end{vmatrix} = 0 \begin{vmatrix} -2 & 1 \\ 0 & -2 \end{vmatrix} = 0$$

$$\Delta y = -10 - 24 + 0 = -34$$

$$\begin{vmatrix} 1 & 2 & 3 \\ 3 & -1 & 0 \\ -2 & 1 & 4 \end{vmatrix} = 0 \begin{vmatrix} 1 & 3 \\ -2 & 4 \end{vmatrix} = 0$$

Encontrando " Δz "

$$\begin{vmatrix} -1 & 2 & 1 \\ 1 & -1 & 3 \\ 0 & 1 & 2 \end{vmatrix} = 0 \begin{vmatrix} 2 & 1 \\ -1 & 3 \end{vmatrix} = 0$$

$$\Delta z = 0 + 7 + 0$$

$$\Delta z = 7$$

$$\begin{vmatrix} -2 & 2 & 1 \\ 1 & -1 & 3 \\ 0 & 1 & -2 \end{vmatrix} = -1 \begin{vmatrix} -2 & 1 \\ 1 & 3 \end{vmatrix} = -[-2(3) - (1)(1)]$$

$$= -[-6 - 1]$$

$$= -[-7]$$

$$= 7$$

$$\begin{vmatrix} -2 & 2 & 1 \\ 1 & -1 & 3 \\ 0 & 1 & -2 \end{vmatrix} = -2 \begin{vmatrix} -2 & 2 \\ 1 & -1 \end{vmatrix} = -2[(-2)(-1) - (1)(2)]$$

$$= -2[2 - 2]$$

$$= 0$$

Encontrando " x ", " y ", " z "

$$x = \frac{\Delta x}{\Delta s} = -\frac{25}{3} \quad \left| \quad y = \frac{\Delta y}{\Delta s} = -\frac{34}{3} \quad \right| \quad z = \frac{\Delta z}{\Delta s} = \frac{7}{3}$$

4. $x + 2y + 3z = -1$
 $-2x + y + 0z = 4$
 $3x - y + z = 2$

$$\begin{vmatrix} 1 & 2 & 3 \\ -2 & 1 & 0 \\ 3 & -1 & 1 \end{vmatrix} = -(-2) \begin{vmatrix} 2 & 3 \\ -1 & 1 \end{vmatrix} = 2[(2)(1) - (-1)(3)]$$

$$= 2[2 + 3]$$

$$= 2(5) = 10$$

$$\begin{vmatrix} 1 & 2 & 3 \\ -2 & 1 & 0 \\ 3 & -1 & 1 \end{vmatrix} = 1 \begin{vmatrix} 1 & 3 \\ 3 & 1 \end{vmatrix} = (1)(1) - (3)(3) = 1 - 9 = -8$$

$$\begin{vmatrix} 1 & 2 & 3 \\ -2 & 1 & 0 \\ 3 & -1 & 1 \end{vmatrix} = -0 \begin{vmatrix} 1 & 3 \\ 3 & -1 \end{vmatrix} = 0$$

$$\Delta s = 10 - 8 + 0$$

$$\Delta s = 2$$

$$\begin{vmatrix} -1 & 2 & 3 \\ 4 & 1 & 0 \\ 2 & -1 & 1 \end{vmatrix} = -4 \begin{vmatrix} 2 & 3 \\ -1 & 1 \end{vmatrix} = -4[(2)(1) - (-1)(3)]$$

$$= -4[2 + 3] = -4(5) = -20$$

Encontrando " Δx "

$$\begin{vmatrix} -1 & 2 & 3 \\ 4 & 1 & 0 \\ 2 & -1 & 1 \end{vmatrix} = 1 \begin{vmatrix} -1 & 3 \\ 2 & 1 \end{vmatrix} = (-1)(1) - (2)(3)$$

$$= -1 - 6$$

$$= -7$$

$$\Delta x = -20 - 7 + 0$$

$$\Delta x = -27$$

$$\begin{vmatrix} -1 & 2 & 3 \\ 4 & 1 & 0 \\ 2 & -1 & 1 \end{vmatrix} = -0 \begin{vmatrix} -1 & 3 \\ 2 & 1 \end{vmatrix} = 0$$

Encontrando " Δy "

$$\begin{vmatrix} 1 & -1 & 3 \\ -2 & 4 & 0 \\ 3 & 2 & 1 \end{vmatrix} = -(-2) \begin{vmatrix} -1 & 3 \\ 2 & 1 \end{vmatrix} = 2 [(-1)(1) - (2)(3)] \\ = 2 [-1 - 6] \\ = 2 (-7) = -14$$

$$\begin{vmatrix} 1 & -1 & 3 \\ -2 & 4 & 0 \\ 3 & 2 & 1 \end{vmatrix} = 4 \begin{vmatrix} 1 & 3 \\ 3 & 1 \end{vmatrix} = 4 [(1)(1) - (3)(3)] \\ = 4 [-8] \\ = -32$$

$$\frac{14}{32} \\ 46$$

$$\begin{vmatrix} 1 & -1 & 3 \\ -2 & 4 & 0 \\ 3 & 2 & 1 \end{vmatrix} = 0 \begin{vmatrix} 1 & 3 \\ 3 & 1 \end{vmatrix} = 0 \quad \begin{matrix} \Delta y = -14 - 32 + 0 \\ \Delta y = -46 \end{matrix}$$

Encontrando " Δz "

$$\begin{vmatrix} 1 & 2 & -1 \\ -2 & 1 & 4 \\ 3 & -1 & 2 \end{vmatrix} = 1 \begin{vmatrix} 1 & 4 \\ -1 & 2 \end{vmatrix} = [(1)(2) - (-1)(4)] = 2 + 4 = 6$$

$$\begin{vmatrix} 1 & 2 & -1 \\ -2 & 1 & 4 \\ 3 & -1 & 2 \end{vmatrix} = -2 \begin{vmatrix} -2 & 4 \\ 3 & 2 \end{vmatrix} = -2 [(-2)(2) - (3)(4)] = -2 [-4 - 12] \\ = -2 [-16] \\ = 32$$

$$\begin{vmatrix} 1 & 2 & -1 \\ -2 & 1 & 4 \\ 3 & -1 & 2 \end{vmatrix} = -1 \begin{vmatrix} -2 & 1 \\ 3 & -1 \end{vmatrix} = -1 [(-2)(-1) - (3)(1)] = -[-2 - 3] \\ = -[-5] \\ = 1$$

$$\Delta z = 6 + 32 + 1 = 38 + 1 = 39$$

Resolviendo " x ", " y ", " z "

$$x = \frac{\Delta x}{\Delta s} = -\frac{27}{2} \quad \left| \quad y = \frac{\Delta y}{\Delta s} = -\frac{46}{2} = -23 \quad \right| \quad z = \frac{\Delta z}{\Delta s} = \frac{39}{2}$$